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Project Title: Coping with Drought in the Russian River Watershed
Recipient Name: The Regents of the University of California, San Diego
PIs/PDs: Dr. F. Martin Ralph (lead)

For this quarter progress has been made under tasks 1-3 of the project tasks

- A postdoctoral scholar, Dr. Julie Kalansky, has been hired and started supporting this project in late 2014.
- Sonoma County Water Agency staff have provided significant input and have engaged in the project.
- Partners in USGS have engaged in the initial steps of the project and are contributing efforts that will help advance tasks 1 and 2 within their own support in the coming year.

Task 1. Evaluate drought ending atmospheric river (AR) characteristics using historical observations and new AR5 climate projections

- A new automated AR detection tool using integrated vapor transport (IVT) has been developed and is in the process of being verified. The automated AR detection tool will be applied to identify ARs in NCEP/NCAR reanalysis data. This will provide a chronology of land falling ARs along the Russian River Watershed from 1948-2013. Climate model (GCM) data needed to identify and describe ARs is being extracted from a subset of GCMs which have archived the necessary surface and 3-D atmospheric variables. Once this data is processed, the AR detection tool will then be applied to new CMIP5 climate projections.

Task 2. Develop a “drought scenario” for the Russian River by engaging Russian River Stakeholders and by using IPCC model analysis in task one, as well as lesson learned from the “ArkStorm” scenario for California flooding.

- Using lists of attendees from past NIDIS meeting and recommendations from Sonoma County Water Agency, we developed a list of stakeholders with whom to engage during the project. The list includes city water managers/engineers, agricultural leaders in the area, fisheries specialists from National Marine Fisheries Service, environmental groups, Resource Conservation Districts and County Emergency Response Offices.
- In order to receive feedback on the drought scenario we developed a questionnaire, which asked questions concerning the impacts and vulnerability to different types of droughts. Questions included the difference

between short, acute droughts as compared to longer less severe droughts. Other questions asked about the impact of temperature and the seasonality of drought. In addition to the questionnaire, we presented at four meetings in the region including the Russian River Watershed Association Meeting, the Santa Rosa Basin Advisory Panel Meeting, the Upper River Water Managers Meeting and the North Bay Climate Adaptation Initiative Meeting. During these meeting we engaged in discussions about the importance of the different types of drought and what might be the most informative. In total we received feedback from over 40 different stakeholders.

Task 3. Develop and carry out a process to characterize the drought readiness for the Russian River in close partnership with Sonoma County Water Agency, using results from task 1 and 2 and past NIDIS workshops

- The questionnaire developed as part of task 2 (see above) was also used to understand all the different dimensions of drought in the Russian River Watershed. Questions solicited information about different vulnerabilities to drought and also the impacts of the current drought. The largest impacts from the current drought were to the agricultural communities with over \$27.7 million dollars of losses reported in Mendocino County. Four city water utilities reported less revenue due to the conservation efforts and two city water utilities report impacts on the recycled water due to less input from large storms. The effects of drought on fisheries and local ecosystems are less clear and needs to be explored further.
- The questionnaire also asked for input on what type of information is most helpful during a drought which will help develop indicators. From the questionnaires, the five most important indicators are Lake Mendocino water levels, stream flow, groundwater recharge, temperature, and groundwater levels.
- We presented the study at the Sonoma Climate Adaptation Forum on April 8th, 2015 to an audience of over 200 people, including city and county leaders, utility managers and the public. The feedback from the audience stated the greatest vulnerabilities of future droughts were to the agriculture communities and increased fire risks. Many of the difficult decisions surrounding drought include decisions on requirements related to new housing and business developments (e.g., lawns and water efficiency) and the best crops to plant. Several responses also mentioned the difficult decisions associated with the competing needs between agriculture and urban use.

Milestones:

- Formal Journal Article for history and future projections of ARs in the Russian*

River

- The research is still in progress. This deliverable is projected to be drafted by the end of the first year, August 2015.

ii. Formal Journal Article for the drought scenario

- The development of the mega-drought scenario is still in progress. We will have a scenario by the summer 2015. Based on the timeline a journal article will be ready by March 2016.

iii. Drought Readiness Report

- The stakeholder feedback has provided information on the dimensions of drought within the region, which is the first component of the readiness report. Additionally feedback from the questionnaire has provided insights into the potential indicators in the region (see task 3). Establishing indicators and a preliminary readiness report will be ready by the winter of 2015/2016 based on the initial timeline.